IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:
Isamu KUROKAWA, et al.
Serial No.: 10/628,784
Filed: July 28, 2003
For: INFORMATION PROCESSING SYSTEM

Art Unit: 2127
Examiner: To Be Assigned
Confirmation No. 5212

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

July 28, 2004
Date of Deposit

Kimberly Yee
Name

Kimberly Yee 07/28/04
Signature Date

PETITION TO MAKE SPECIAL UNDER MPEP § 708.2, VIII

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I. **Petition**

Applicants hereby petition to make this new application, which has not received any examination by the Examiner, Special.

II. **Claims**

Check and complete all applicable items (a) through (c).

(a) x All the claims in this case are directed to a single invention.

(b) x If the Office determines that all the claims presented are not obviously directed to a single invention, Applicants will make an election without traverse as a prerequisite to the grant of special status.

08/03/2004 ZJUHAR1 00000058 10628784
01 FC:1460 130.00 OP

III. **Search**

A. Check all applicable items (d) though (g)

A search has been made by

(d) _ the inventor

(e) _ attorney

(f) x professional searcher (Search Report attached hereto)

(g) _ foreign Patent Office

in the following:

B. Complete all applicable items below

(h) x field of search:

Class	Subclasses
711	18, 133, 134, 136, 137

(i) _ publications:

(j) _ foreign patents:

(k) _ search by corresponding foreign Patent Office or at the former International Patent Institute at The Hague, Netherlands

C. Copy of references

There is submitted herewith a copy of the references deemed most closely related to the subject matter encompassed by the claims. These references are also listed in the attached Information Disclosure Statement.

D. Detailed discussion of the references

There is submitted herewith a detailed discussion of the references which discussion particularly points out how the claimed subject matter is distinguishable over the references.

E. Fee

The fee required by 37 CFR 1.17 (h) is to be paid by

x The attached check in the amount of $130.00. If there are any additional fees due in connection with the filing of this Petition to Make Special, please also charge those fees to our Deposit Account No. 50-1314.

Respectfully submitted,
HOGAN & HARTSON L.L.P.

Date: July 28, 2004

By: _____
Sterlon R. Mason
Registration No. 41,179
Attorneys for Applicants

500 South Grand Avenue, Suite 1900
Los Angeles, California 90071
Phone: 213-337-6700
Fax: 213-337-6701

DETAILED DISCUSSION OF THE REFERENCES AND COMPARISON TO THE PRESENT INVENTION

IV. Field of the Invention:

The subject matter of the above-identified application relates to controlling data look-ahead from an external storage device to a cache memory within a control device in random access input/output (I/O) request processing from a host processing device.

V. Related Background Art:

Known data look-ahead technology that accumulates access pattern history information to predict future access patterns exits for retrieving data. Also, technology regarding optimizing the amount of data to be loaded to a cache memory is also known for retrieving data. When performing a process in which random assesses to a database are concentrated with a certain period of time, several drawbacks exist with the conventional assessed pattern history information based loading mode methods for retrieving data that include: (1) a poor sensitivity due to the random nature of the random accesses which cannot offer the optimum loading load; (2) an inability to realize a rapid improvement in the cache hit rate; and (3) a reliance on the performance (seek time + time for a disk to make one revolution + transfer time) of one hard disk drive (HDD) for responsiveness. (*See, Application, Page 1, Line 14 – Page 2, Line 20*).

VI. The References:

A. The Yanai et al. Reference:

U.S. Patent No. 6,035,375 to Yanai et al. (hereinafter "Yanai") discloses a cache management system having a cache memory with an allocable micro-cache. According to the system disclosed by Yanai, a cache manager 10 includes a cache memory 12 and an associated cache index/directory 16. The cache manager 10 aids in buffering I/O operations received from one or more host computers 22a-22b that are directed to data storage devices 18a-18b. The cache manager 10 uses three parameters in initiating and controlling a prefetch operation. The first parameter is a threshold value that is used in determining if a current operation is a sequential access, activating a prefetch. The second parameter sets the number of data tracks to be loaded in a prefetch operation, and the third parameter determines the amount of space in the cache memory 12 to be used for the particular prefetch operation before the retrieved data tracks are written over. The parameters are dynamically altered by the cache manager 10 to optimize the performance of the system (*See, Column 7, Line 62 – Column 9, Line 21*). U.S. Patent Nos. 5,381,539 and 5,537,568, also to Yanai provide similar disclosures.

B. The Yochai et al. Reference:

U.S. Patent No. 6,721,870 to Yochai et al. ("hereinafter "Yochai") discloses a system that employs a prefetch algorithm for short sequences. According to Yochai, data processing system 10 includes a plurality of host computers 12a-12m that are connected with data storage system 14 by means of a controller 16. The controller 16 operates to handle I/O requests from the host computers 12a-12m directed to the data storage. Data storage system 14 includes a plurality of disk devices 18a-18k and a global memory 36, which contains cache memory 40 and tables 42 that map areas the disk devices 18a-18k to areas in the cache memory 40. The cache memory

40 acts as a buffer to I/O operations involving the disk devices, and is provided with a short sequence prefetch process 72a that maintains a history of short sequences and uses the data in determining a dynamically adjustable expected length probability threshold 74 that is used in enabling or disabling the short sequence prefetch process 72a. (*See, Yochai, Column 2, Line 55- Column 3, Line 13; Column 4, Lines 52-59; and Column 6, Lines 24-53*).

VII. The Present Invention is Patentably Distinguishable Over the Cited References

A. One Embodiment of the Present Invention:

The present invention seeks to address the above drawbacks that exist with the conventional assessed pattern history information based loading mode methods for retrieving data. According to an embodiment of the present invention, an information processing system includes a host processing device and an external storage device that uses one or more physical devices to store data subject to I/O requests from a host processing device. The information processing system also includes a control device intervening between the host processing device and the external storage device. The control device determines whether an I/O request for a data block from the host processing device concerns a specific data space within a group of a limited number of data spaces and determines a magnitude of impact that a look-ahead processing performed at present have on other I/O requests. The control device also controls to load more data blocks than the data blocks that is a subject of the I/O request into a cache memory depending on a determination result when transferring to the host processing device the data block that is the subject of the I/O request from the host processing device.

As described above, instead of predicting a future access pattern as conventionally taught, when it is determined that a cache memory can be occupied in response to a current I/O request and the current I/O request does not impact other I/O requests, data, including a plurality of blocks significantly larger than the block that is the subject of the I/O request are loaded to the cache memory in a single access to the HDD. Thus, an embodiment of the present invention maximizes the usage rate of resources (the cache memory and buses) by reading more data than the data required instead of predicting. Even in the random access of data, as long as the size of a database has a limit, there is a high possibility that an access would occur in the vicinity of a region previously accessed. (*See, Application, Pages 17, Lines 19*). Also according to an embodiment of the present invention, the database with the most recent I/O request or with the highest I/O frequency becomes a target of a look-ahead, thereby enhancing efficiency in terms of cache hits and in terms of memory usage efficiency. (*See, Application, Page 19, Lines 4-9*).

B. Distinction Over the Cited References:

The cited references do not disclose the above features of the present invention. In particular, the cited references fail to disclose or suggest the feature of "the control device [that] determines. . .a magnitude of impact that a look-ahead processing performed at present have on other I/O requests" as recited in each of the independent claims of the present application, namely independent claims 1 and 13.

The cache management system of Yanai is provided to monitor and control the contents of a cache memory couple to at least one host computer and at least one data storage device. According to the system disclosed by Yanai, a cache manager 10 includes a cache memory 12 and an associated cache index/directory 16. The cache manager 10 aids in buffering I/O operations received from one or more

host computers 22a-22b that are directed to data storage devices 18a-18b. The cache manager 10 uses three parameters in initiating and controlling a prefetch operation. The first parameter is a threshold value that is used in determining if a current operation is a sequential access, activating a prefetch. The second parameter sets the number of data tracks to be loaded in a prefetch operation, and the third parameter determines the amount of space in the cache memory 12 to be used for the particular prefetch operation before the retrieved data tracks are written over. The parameters are dynamically altered by the cache manager 10 to optimize the performance of the system. (*See, Column 7, Line 62 – Column 9, Line 21*). Accordingly, Yanai does not disclose or suggest a control device that determines a magnitude of impact that a look-ahead processing performed at present have on other I/O requests as claimed.

The system that employs a prefetch algorithm for short sequences disclosed in Yochai is used for generating prefetch tasks for short sequences that are no longer than n track in length. According to Yochai, data processing system 10 includes a plurality of host computers 12a-12m that are connected with data storage system 14 by means of a controller 16. The controller 16 operates to handle I/O requests from the host computers 12a-12m directed to the data storage. Data storage system 14 includes a plurality of disk devices 18a-18k and a global memory 36, which contains cache memory 40 and tables 42 that map areas the disk devices to areas in the cache memory. The cache memory 40 acts as a buffer to I/O operations involving the disk devices, and is provided with a short sequence prefetch process 72a that maintains a history of short sequences and uses the data in determining a dynamically adjustable expected length probability threshold 74 that is used in enabling or disabling the short sequence prefetch process 72a. (*See, Yochai, Column 2, Line 55- Column 3, Line 13; Column 4, Lines 52-59; and Column 6, Lines 24-53*). Likewise, Yochai also fails to disclose or suggest a control device

that determines a magnitude of impact that a look-ahead processing performed at present have on other I/O requests as claimed.

Since the cited references fail to disclose, teach or suggest the above feature recited in each of the independent claims, these references cannot be said to anticipate nor render obvious the invention which is the subject matter of these claims.

Accordingly, independent claims 1 and 13 are believed to be in condition for allowance and such allowance is respectfully requested. The remaining claims depend either directly or indirectly from independent claims 1 and 13 and recite additional features of the present invention which are neither disclosed nor fairly suggested by the cited references and are therefore also believed to be in condition for allowance.

VIII. Conclusion

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance and such action is respectfully requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the Los Angeles, California telephone number (213) 337-6809 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees in connection with the filing of this petition, please charge the fees to our Deposit Account No. 50-1314.

PTO/SB/17 (10-03)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 130.00

Complete if Known	
Application Number	10/628,784
Filing Date	July 28, 2003
First Named Inventor	Isamu KUROKAWA, et al.
Examiner Name	To Be Assigned
Art Unit	2127
Attorney Docket No.	81940.0053

METHOD OF PAYMENT *(check all that apply)*

☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☐ Deposit Account:

Deposit Account Number: 50-1314

Deposit Account Name: Hogan & Hartson L.L.P.

The Director is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☐ Credit any overpayments

☒ Charge any additional fee(s) or any underpayment of fee(s)

☐ Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

		Extra Claims		Fee from below		Fee Paid
Total Claims		-20** =		X	=	
Independent Claims		- 3** =		X	=	
Multiple Dependent					=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	130.00
1807	50	1807	50	Processing fee under 37 CFR 1 17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR 1 129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR 1 129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 130.00

SUBMITTED BY

(Complete if applicable)

Name (Print/Type)	Stephen R. Mason	Registration No. (Attorney/Agent)	41,179	Telephone	213/337-6700
Signature				Date	07/28/04

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